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ABSTRACT

Nutrition is well-recognized as a necessary component of educational programs for physicians. This is to be valued in that of all factors affecting health in the United States, none is more important than nutrition. This can be argued from various perspectives, including health promotion, disease prevention, and therapeutic management. In all cases, serious consideration of nutrition related issues in the practice is seen to be one means to achieve cost-effective medical care. These modules were developed to provide more practical knowledge for health care providers, and in particular primary care physicians. The goal of this module is to assist physicians in planning and providing nutritional support for the greatest advantage of both the mother and the fetus during pregnancy and lactation. Included are the learning goals and objectives, self-checks of achievement with regard to goals, and references for the physician and for the physician to give to the patient. The appendices including recommended nutrient allowances, foods classified by food groups, a list of plant protein sources and ethnic foods, a list of common problems in pregnancy with possible causes and dietary treatment, a list of the practicalities of breastfeeding, and a chart of drug use in breastfeeding mothers. (CW)

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7 Normal Diet: Pregnancy and Lactation

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Charlette R. Gallagher-Allred

Nutrition in Primary Care

Department of Family Medicine
The Ohio State University
Columbus, Ohio 43210

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16. An Office Strategy for Nutrition-Related Patient Education and Compliance

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7 Normal Diet: Pregnancy and Lactation

Nutrition in Primary Care

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Introduction

Both pregnancy and lactation impose a nutritional stress to the maternal organism. The fetus and the breast-fed infant are like parasites to the pregnant and lactating woman. They receive their nutrition through the maternal diet or through the mother's own body stores. It is, therefore, important for pregnant and lactating women to be well fed.

What are the nutritional requirements during pregnancy and lactation? How does the woman obtain these requirements? How do you as the physician evaluate whether or not these requirements are being met?

Specifically, the goal in this module is to assist you in planning and providing nutritional support for the greatest advantage of both the mother and the fetus or infant during pregnancy and lactation.

Goals

As a result of this unit of study of pregnant and lactating women, you should be able to:

1. *Identify their nutritional needs;*
2. *Identify their potential or actual nutritional risks;*
3. *Assess their nutritional status; and*
4. *Formulate nutritional counseling plans for these women, given their nutritional risks and status.*

Physiological Needs During Pregnancy and Lactation

Nutritional requirements are based on several factors:

1. Measurements of nutrient accretion in maternal and fetal tissues.
2. Animal and human balance studies.
3. Analysis of food composition and dietary intake of healthy individuals producing healthy offspring.

The recommended intake of nutrients includes allowances for human variation and the efficiency of absorption and utilization. They are summarized in Appendix A at the back of this module.

Protein

The intake of protein during pregnancy and lactation must meet the needs of the mother as well as provide sufficient protein for fetal development and, later, lactation. A young, pregnant adolescent who is still growing needs to consume even greater amounts of protein to provide for her growth and that of the fetus.

The recommended protein intake during pregnancy for the purpose of building fetal and accessory tissue is based on the preconceptional weight and age of the pregnant female. Recommended protein intake during pregnancy varies as can be seen in Table 7–1.

Approximately 925 grams of protein are needed in the building of fetal and accessory tissues during pregnancy. The rate of protein accretion varies as is shown in Table 7–2. Additional protein intake during various stages of fetal development may be stored to some extent for later utilization.

The recommended protein intake during lactation depends on the age of the lactating woman, the stage of lactation, and the amount of milk produced. Table 7–3 gives the recommended protein intake during lactation for various-aged lactating women. The recommendation takes into account the stage of lactation and amount of milk produced.

Human milk protein (approximately 1.2 grams protein/100 milliliters, or 0.4 gram/ounce) is produced from maternal dietary protein with 90% efficiency. *Deficiencies in maternal protein intake will not change the composition of the breast milk, but they will decrease the total volume of milk produced.*

Table 7–1 Recommended Protein Intake for Various-Aged Pregnant Women

Age	Recommended Protein Intake	
	gms per kg ibw	gms per lb ibw
Adolescent female		
Age 11–14 yrs	1.7	0.77
Age 15–18 yrs	1.5	0.68
Mature Female	1.3	0.59

Table 7–2 Protein Accretion During Fetal Growth

Stages of Gestation	Daily Protein Accretion in Grams
1st Quarter	0.6
2nd Quarter	1.8
3rd Quarter	4.8
4th Quarter	6.1

Kilocalories

The requirement for kilocalories during pregnancy is based on preconceptional weight and weight gain throughout the pregnancy. Caloric needs prior to conception range from 30 kilocalories per kilogram per day (14 kilocalories per pound per day) for the mature female to double that for the young adolescent. An additional 300 kilocalories per day are necessary to achieve the ideal weight gain of 10 to 12 kilograms (22 to 27 pounds) during pregnancy.

Although a total weight gain of 10 to 12 kilograms (22 to 27 pounds) is recommended during pregnancy, additional weight gain may be desirable if the female is more than 20% underweight at the time of conception (see Table 7–10 in the section on nutritional assessment in this module). **Weight loss is not recommended during pregnancy.** Because the incidence of maternal morbidity increases at a weight gain exceeding 18 kilograms (40 pounds), control of weight gain is highly desirable.

To achieve recommended weight gain, an average of 86,000 additional kilocalories over 280 days, or approximately 300 additional kilocalories per day, are needed as shown in Table 7–4.

Table 7–3 Recommended Protein Intake for Various-Aged Lactating Women

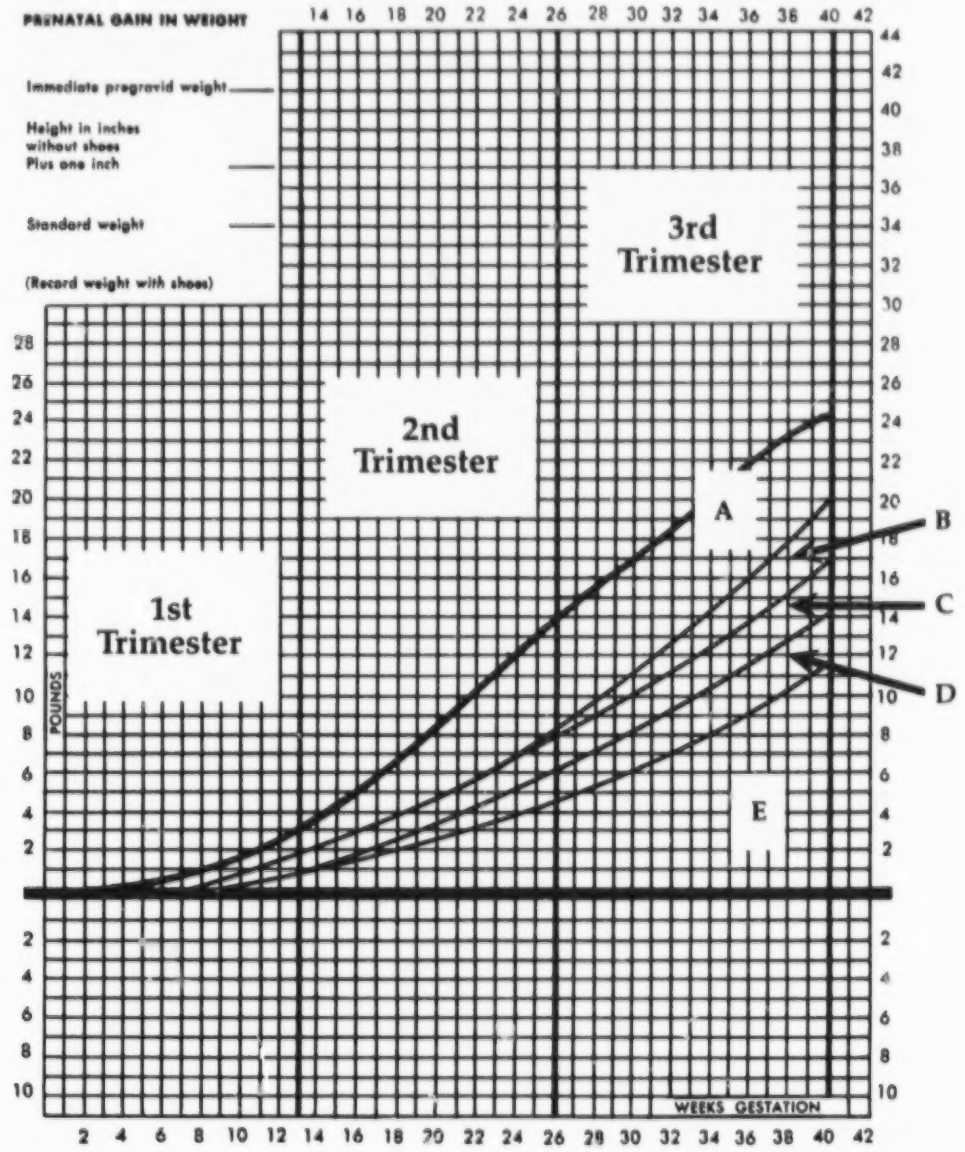
Age	Recommended Protein Intake	
	gms per kg ibw	gms per lb ibw
Adolescent Female	1.0 gms/kg + 20 gms	0.45 gms/kg + 20 gms
Mature Female	0.8 gms/kg + 20 gms	0.36 gms/kg + 20 gms

Table 7–4 Daily Kilocalorie Need During Pregnancy and Lactation for the Mature Female

preconceptional weight (kg)	preconceptional weight (lb)	preconceptional caloric need (kcal)	total caloric need during pregnancy (kcal)	total caloric need during lactation* (kcal)	
				1 month	6 months
50	110	1,500	1,800	1,800	2,200
55	120	1,650	1,950	1,950	2,350
60	132	1,800	2,100	2,100	2,500
65	143	1,950	2,250	2,250	2,650
70	154	2,100	2,400	2,400	2,800

*Assuming normal weight gain during pregnancy to provide maternal caloric stores; if weight gain is inadequate, increase kilocalorie allowance by 200 kilocalories. These kilocalorie levels are based on infant growth at the 50th percentile.

Figure 7–1 Prenatal Weight Gain Grid


PRENATAL GAIN IN WEIGHT
Immediate pregravid weight
Height in inches without shoes Plus one inch
Standard weight
(Record weight with shoes)
3rd Trimester
2nd Trimester
1st Trimester
A
B
C
D
E
POUNDS
WEEKS GESTATION
14 16 18 20 22 24 26 28 30 32 34 36 38 40 42
2 4 6 8 10 12 14 16 18 20 22 24 26 28 30 32 34 36 38 40 42

*A = maternal stores (dry weight)
B = tissue fluid
C = blood
D = uterus, breasts
E = fetus, placenta, amniotic fluid

From Lull, C.B. and Kimbrough, R.A.: *Clinical Obstetrics*. Philadelphia, J.B. Lippincott Company, 1953. Used with permission of J.B. Lippincott Company, © 1953, Philadelphia, PA.

Weight gain should not be consistent throughout the forty- week gestational period but should be gradual. A 1- to 2-kilogram gain (2 to 5 pounds) during the entire first trimester is recommended, increasing to 0.4 kilogram (nearly 1 pound) per week during the last two trimesters as shown in Figure 7–1.

Kilocalorie needs during lactation are based on 85% to 90% efficiency in converting maternal food kilocalories into breast milk. Approximately two-thirds of the kilocalories in breast milk are derived from the maternal diet, while one-third is derived from maternal stores. As the infant gains weight and requires more kilocalories, the maternal diet must also increase in kilocalorie content (refer to Table 7–4).

If maternal protein requirements are met, protein will supply approximately 20% of total kilocalorie intake. The remaining kilocalories should be supplied by carbohydrate (40% to 45% total kilocalories) and fat (35% to 40% total kilocalories). The total amounts of carbohydrate and fat in breast milk are not altered by changes in the maternal diet. However, the fatty acid composition is influenced to some extent by maternal dietary intake of carbohydrate, fat, and total kilocalories.

Vitamins

Vitamin needs increase during pregnancy and lactation. It is, therefore, important that extra foods consumed to meet kilocalorie needs are also rich in vitamins. Inadequate vitamin intake may cause decreased milk production.

The recommended allowances for vitamins during pregnancy and lactation are listed in Appendix A. Due to the increased need for nearly all vitamins during pregnancy and lactation, it is important that extra foods consumed to meet kilocalorie needs are also rich in vitamins. Table 7–5 shows both the recommended allowances for vitamins during pregnancy and lactation and the foods that are rich sources of these vitamins.

If the maternal diet is inadequate in vitamin content, the vitamin content of the human milk produced will not be significantly affected; however, there may be a decrease in the total amount of milk produced. Due to efficient storage of the fat-soluble vitamins, increases in requirements for vitamins A, D, and E are minimal during pregnancy and lactation. Because water-soluble vitamins are not stored to a large extent, there is an increased daily need for the B vitamins and for vitamin C during pregnancy and lactation.

Minerals

Patients should be encouraged to continue prenatal supplementation of multivitamins and minerals for one full year after each pregnancy.

The recommended intake for meeting the mineral requirements of both fetal (later infant through breast milk) and maternal tissues is listed in Appendix A. Generally, fetal tissues and breast milk will not reflect deficient maternal mineral intake, as maternal tissue stores will maintain the standard mineral composition of breast milk. However, it is important to maintain or replenish maternal stores both for maternal well-being and for subsequent pregnancies. Table 7–6 shows the recommended allowances for minerals during pregnancy and lactation and the foods that are rich sources of these minerals.

It is wise to advise your patients that a maternal repair period of 9 to 12 months between conceptions should be planned. Maternal deficiencies such as iron-deficiency anemia frequently occur during pregnancy and lactation. Continuing prenatal supplementation of multivitamins and minerals for one full year after each pregnancy is encouraged (any preparation designed for prenatal use is acceptable).

Iron

A daily intake of 30 to 60 milligrams of supplemental iron is recommended during pregnancy and lactation, usually through a pharmaceutical preparation of ferrous sulfate (a compound which is 20% elemental iron), ferrous gluconate (12% elemental iron), or an iron-carbohydrate complex.

Maternal needs for iron, fetal tissue accretion (particularly during the last trimester), and allowance for losses during delivery increase the iron requirement during pregnancy by approximately 3 to 4 milligrams per day. Allowing for an average absorption of iron at 10%, a daily intake of 30 to 60 milligrams of iron is recommended. The iron needs during lactation are not substantially different from those of nonpregnant women. Continued supplementation of the mother for two to three months and even up to one year after parturition is advisable in order to replenish stores depleted by pregnancy.[4]

Table 7–5 RDA for and Possible Food Sources of Vitamins Needed During Pregnancy and Lactation

Vitamin	Recommended Daily Allowances	Possible Sources
Vitamin A	1,000 - 1,200 R.E.[a]	½ cup cooked carrots or 1/3 cup spinach
Vitamin E	10 - 11 mg T.E.[b]	3 teaspoons vegetable oil
Thiamin	1.4 - 1.6 mg	8 ounces cooked pork or 1 cup enriched cereal
Riboflavin	1.5 - 1.8 mg	2 ounces beef liver or 4 cups milk
Niacin	15 - 20 mg N.E.[c]	5 ounces cooked chicken or 5 tablespoons peanut butter
Folacin	500 - 800 µg[d]	15 ounces liver or 3 cups beans
Vitamin B_{12}	4 µg	4 cups milk or 8 ounces meat
Ascorbic Acid	70 - 100 mg	1 cup orange juice or 2/3 cup broccoli

[a] R.E. (Retinol equivalents); 1 R.E. = 1 µg retinol or 6 µg β-carotene
[b] T.E. (Tocopherol equivalents); 1 T.E. = 1 mg d-∝-tocopherol
[c] N.E. (Niacin equivalents); 1 N.E. = 1 mg niacin or 60 mg dietary tryptophan
[d] It is usually impractical to expect that dietary sources of folacin will be adequate to meet needs; pharmaceutical supplementation with 400 to 800 µg is, therefore, recommended.

Calcium

The recommended daily intakes of calcium during pregnancy and lactation are 1,200 milligrams for the mature female and 1,600 milligrams for the adolescent female, supplied in the diet most easily by 4 to 6 servings of milk or dairy products daily.

Calcium accretion during fetal development approximates 25 grams at term. Most of the calcium deposition in the fetus takes place during the last trimester at a daily rate of 200 to 300 milligrams. Although maternal absorption and storage of calcium appear to be more efficient during pregnancy and lactation, 400 milligrams of calcium intake per day *above* daily maternal needs (or a total of 1,200 to 1,600 milligrams calcium per day) is recommended.

Table 7–6 Recommended Intake of Minerals During Pregnancy and Lactation and Food Sources

Mineral	Recommended Allowances	Possible Sources
Calcium	1,200 milligrams 1,600 milligrams for the adolescent	4 cups of milk or 4 ounces of cheese, or 4 pharmaceutical calcium supplements
Phosphorus	1,200 milligrams 1,600 milligrams for the adolescent	1 egg, 3 ounces of cheese, and 6 ounces of meat
Iodine	175 - 200 µg	1 teaspoon of iodized salt
Iron	*	30 to 60 milligrams of iron supplement
Magnesium	450 milligrams	4 servings of fruits and vegetables, 3 slices of bread, and 8 ounces of meat
Zinc	20 - 25 milligrams	4 cups of milk

*The increased requirement for iron during pregnancy cannot be met by the iron intake of habitual American diets or by the existing stores of many women; therefore, the use of 30 to 60 milligrams of supplemental iron is recommended.[4]

Sodium

Routine restriction of sodium intake during pregnancy and lactation is not recommended.

Although there is no established specific amount of sodium required to meet pregnancy and lactation needs, sodium is an important constituent of fetal and infant tissues and extracellular fluids. The 50% increase in maternal blood volume alone at 150 milliequivalents sodium per liter requires at least 5,000 milligrams of sodium. During pregnancy, urinary sodium loss may be greater than in the nonpregnant state. During lactation, sodium intake must supply the normal sodium content of breast milk which is 161 milligrams per liter. Salt supplied as iodized salt also provides an important source of iodine in the diet. For these reasons, routine restriction of sodium intake during pregnancy and lactation is not recommended.

If a sodium restriction is necessary in the treatment of pathologic conditions (heart disease, liver disease, renal disease, or hypertension) during pregnancy or lactation, allow at least 2 grams of sodium per day. Pre-eclampsia and eclampsia do not appear to be related to the level of sodium intake. Restriction of sodium intake as treatment in these cases provides varying results. Sodium depletion may occur if sodium intake is restricted to less than 2 grams per day in combination with vomiting, diarrhea, excessive sweating, or diuresis.

Meeting Nutritional Needs During Pregnancy and Lactation

In the preceding section, the nutritional requirements and recommended levels of intake for nutrients were listed and discussed. This section provides dietary guidelines on foods which should be consumed to meet nutritional needs during pregnancy and lactation.

Sarah Jones, a 21-year-old, 59-kilogram (130 pounds), 168-centimeters-tall (5 feet 6 inches) woman in her third month of pregnancy, walks into your office seeking medical advice for the term of her pregnancy. She has no complicating medical problems. Thus, it is a relatively simple matter to estimate her nutritional needs: approximately 77 grams of protein per day (refer to Table 7–1), 2,100 kilocalories per day (refer to Table 7–4), and 80 milligrams ascorbic acid and 1,200 milligrams calcium daily (refer to Appendix A). What should you look for in Sarah's diet to estimate how well she is meeting her nutritional needs? If Sarah is not presently meeting her nutritional needs, what should you advise?

Table 7–7 includes an excellent food guide which will help you plan a well-balanced meal pattern with your pregnant and lactating patients. As you can see in Table 7–7, the number of servings of foods to be consumed daily is based on food groups. Individual foods are classified into food groups based on nutrient content. The following 6 food groups are those listed in Table 7–7. Listed with each food group are the major nutrients supplied by the foods within the groups.

Table 7–7 Daily Food Guide for Nonpregnant, Pregnant, and Lactating Women

Food Group	Number of Servings Per Day	
	Nonpregnant Woman	Pregnant or Lactating Woman
Protein Foods (animal and vegetable)	3	4
Milk and milk products	2	4
Grain products	3	3
Vitamin C-rich fruits and vegetables	1	2
Leafy green or orange vegetables	1	1
Other fruits and vegetables	2	2

Adapted from Corruccini, C.G. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

1. *Protein Foods Group (animal and vegetable)*
   Meat, fish, poultry, eggs, beans, and lentils provide protein, iron, phosphorus, magnesium, and B-complex vitamins.
2. *Milk and Milk Products Group*
   Milk and milk products provide protein, calcium, phosphorus, vitamins A, D, and riboflavin.
3. *Grain Products Group*
   Grain products provide B-complex vitamins, iron, phosphorus, and zinc.
4. *Vitamin C-rich Fruits and Vegetables Group*
   Vitamin C-rich fruits and vegetables include the citrus fruits (oranges, grapefruit, lemons, limes) and the vegetables (broccoli and other greens, tomatoes, sweet potatoes, potatoes) which contain high amounts of vitamin C compared to other fruits and vegetables.
5. *Leafy Green and Orange Vegetables Group*
   Leafy green vegetables (broccoli, greens of all varieties) and orange vegetables or fruits (carrots, squash, sweet potatoes, pumpkin) supply a very high amount of vitamin A plus many other vitamins and minerals, especially folic acid, magnesium, and iron.
6. *Other Fruits and Vegetables Group*
   Fruits and vegetables, in addition to the citrus fruits and leafy green and orange vegetables, supply vitamins such as A and C along with folic acid and minerals such as magnesium and iron; however, they supply comparatively lower amounts of these nutrients and should be consumed daily.

In order to help pregnant and lactating women plan adequate meal patterns, you should know what foods are included in each of these 6 food groups and the respective amounts which equal one serving. With this knowledge, the food groups and the number of servings listed in Table 7–7 will become more meaningful to you. You will probably want to use Table 7–7 and Appendix B as part of your "fingertip" library. Both Table 7–7 and Appendix B are excellent handout materials for patients. Appendix C includes several tables which will supplement Table 7–7 and Appendix B when you are counseling patients of various ethnic populations or if the patient is a vegetarian by either ethnic, religious, or personal choice.

Encourage all of your patients to consume daily a *variety* of foods from each of the food groups. For example, although you recommend 4 servings from foods in the milk and milk products group to meet the needs for protein, calcium, phosphorus, and vitamins A and D, Sarah may choose to consume 4 cups (1 liter) of milk or 1 cup of milk, 1 cup (240 grams) of yogurt, and 2 ounces (60 grams) of cheese or alternatively any other 4-serving combination of foods listed in the milk and milk products group.

The food guide (Table 7–7) is not specifically designed to ensure adequate kilocalorie intake due to the wide variation in caloric needs and food composition. Food choices within each group, while meeting the food guide recommendations, may provide between 1,600 and 3,200 kilocalories. For example, Sarah may choose to drink 1 cup of skim milk or 1 cup of milkshake. Both provide the same amounts of protein, calcium, and vitamin D, but the skim milk provides 85 kilocalories and the milkshake provides 280 kilocalories. Additional kilocalories are also provided by the addition or incorporation of sugars, fats, and oils to the foods listed in each group.

The recommendation (Appendix B) to eat four 2- to 3-ounce servings of animal or vegetable protein daily may be unreasonable due to costs of food and/or the patient's appetite. Because milk and milk products supply protein, an alternative of 6 ounces of meat or vegetable protein in addition to the recommended milk consumption will provide all the needed protein for maternal and fetal, or infant, needs. Eggs, cheese, poultry, fish, beans, and lentils are usually less expensive than meat and allow variation in the diet.

Sarah's daily *requirement* for iron is 3 to 4 milligrams; the recommended daily intake for nonpregnant women is 18 milligrams. The recommended daily intake, which is much higher than the requirement, allows for inefficient absorption of iron from various food sources. For example, heme iron, supplied by meat, poultry, and fish, is approximately 30% absorbed. Iron compounds in green leafy vegetables or whole grain products are approximately 10% absorbed.

If a person consumed 10 ounces of lean, cooked meat, poultry, or fish, each of which contains approximately 10 milligrams of iron, only about 3 milligrams of iron would be absorbed. Two serv-

ings per day of green leafy vegetables contain approximately 8 milligrams iron and supply approximately 0.8 milligram of absorbable iron. Thus, the total iron intake is 18 milligrams, but the total iron absorbed is 3.8 milligrams. Although Sarah and other pregnant or lactating women could theoretically meet iron needs through proper diet, it is probably best that you not assume that your patients will eat this way for the one to two years of pregnancy and lactation. Therefore, it is highly recommended that pregnant and lactating women take 30 to 60 milligrams of supplemental iron daily (average 10% absorption).

If your pregnant or lactating patients do not like milk, have an allergy to milk, or have a lactase deficiency, alternative food choices which are high in calcium are found in Appendix B. Variations to the diet may include cheese and breakfast drink supplements which generally contain less lactose but which provide protein, calcium, and vitamins A and D. Green leafy vegetables also supply significant amounts of calcium, although the calcium in these products is less available for absorption. If your patient refuses milk, milk products, and suitable food substitutes, prescribe supplements of calcium and vitamin D. Pharmaceutical supplements of calcium generally contain only 200 to 250 milligrams of calcium per dose and thus supply only 20% of the daily calcium needs per dose. Giving a supplement of vitamin D supplying 400 IU should be adequate if your patient receives one to two hours of sunlight daily. A supplement providing 400 IU of vitamin D per dose given as 2 doses per day will supply the recommended daily intake for vitamin D when exposure to sunlight is more limited.

Consumption of adequate folic acid is difficult during pregnancy because of the increased need for fetal development. A pharmaceutical supplement of folic acid of 400 to 800 μg per day is recommended.

Potential Problems During Pregnancy and Lactation

Several problems may arise during pregnancy which require some manipulation of the diet. Sarah may complain of nausea and vomiting during the early stages of her pregnancy and constipation and heartburn later in her pregnancy.

These and other problems occurring during pregnancy, such as hemorrhoids, inadequate or excessive weight gain, diabetes mellitus, anemia, toxemia, drug, alcohol, or tobacco abuse, are not cured by diet but may be treated successfully by dietary manipulation appropriate for each.

As a physician, you are concerned not only with the nutrition of Sarah and her fetus, but also with the nutrition of her infant after birth. When is a good time to start talking to Sarah about breastfeeding? Basic information concerning the advantages and disadvantages of both breast- and bottle-feeding should be given in the early to middle prenatal period. Discussions, demonstrations, and examination of the nipples may be done six to eight weeks before the expected date of confinement (EDC). Continued support concerning positioning of the baby, building a milk supply, and dealing with sore and cracked nipples, breast infections, stasis, and exhaustion is necessary for you to give to ensure successful breastfeeding. A checklist for counseling breastfeeding mothers is given in Appendix E.

To initiate breastfeeding successfully:

1. **Start breastfeeding within the first hour after delivery or at the earliest possible time;**
2. **Feed on demand (even in the hospital);**
3. **Begin with five minutes at each breast for each feeding during the first day; gradually increase the duration of each feeding throughout the first week;**
4. **Comfortably position the mother and infant with adequate support for the infant's weight, usually achieved by placing a pillow on the mother's lap; and**
5. **Avoid the use of supplemental formula or other feedings during the first six- to eight-week period except in extreme emergencies.**

If Sarah decides to breastfeed, she may or may not have the support and encouragement of her own mother. Breastfeeding in humans is not an instinct but rather a learned behavior. The infant cannot crawl to seek and find the mother's breast. Human mothers must distinguish between diaper discomfort, loneliness, and hunger cries. Table 7–8 suggests a timetable for patient education concerning breastfeeding.

For a listing of drugs and their acceptability during lactation, refer to Appendix F. Many drugs taken by the lactating mother do not appear in physiological quantities in breast milk. However, many drugs have not been fully studied or evalu-

Table 7–8 Timetable for Patient Education Concerning Breastfeeding

Time	Information to be Taught
Early to middle prenatal period	Basic information on benefits/ advantages of breastfeeding for baby and mother
	Question/answer session
	Nipple and breast care
Six to eight weeks before Expected Date of Confinement (EDC)	Examination of nipples for protractility
	Demonstration/return demonstration, discussion of nipple preparation techniques
	Review of previous information
	Question/answer session
Immediately post partum	Correct positioning of mother and baby for nursing
	Assessment of maternal-infant interaction and support systems
	Techniques for preventing breastfeeding discomfort
Continuing post partum	Guidance and encouragement as needed
	Review of prenatal information as relevant

From Berg, T.A.: "Nursing the Newborn." *Seminars in Perinatology: Human Lactation*, Vorherr, H. (ed.), New York, Grune and Stratton, III(3), July, 1979, p. 243. Used with permission of Grune and Stratton, Inc., © 1979, New York, NY.

ated in terms of effect on the lactating mother and her infant. Drugs of any kind should be used with great discretion and careful weighing of the risks versus the potential benefits. For information about the cellular, enzymatic, and nitrogenous constituents of breast milk, please refer to reviews in *Current Problems in Pediatrics*[8] and in *Seminars in Perinatology*.[7] The role of breastfeeding in maternal-infant bonding as it reinforces attachment by providing emotional and physiological closeness, pleasure, and comfort to both mother and infant is discussed in *Maternal and Infant Bonding*.[5]

Let us review for just a moment before we go on to the following section on nutritional assessment. As you are assessing a particular patient's nutritional needs, consider the patient's age and body mass to estimate protein and kilocalorie needs (Tables 7–1, 7–3, and 7–4). The patient's vitamin and mineral needs are summarized in Tables 7–5 and 7–6, respectively. The patient's nutritional needs may be met by following the Daily Food Guide (Table 7–7) and by supplementing with 30 to 60 milligrams of elemental iron and 400 to 800 micrograms of folic acid.

How do you know if your patient is meeting her nutritional needs? Before giving any advice, ask questions, gather objective data, and complete a nutritional assessment. Anthropometric, biochemical, physical, and dietary intake data may reveal good nutritional status reflecting appropriate nutritional habits. These may only need reinforcement during this nutritionally stressful time. A nutritional assessment may also reveal several specific or special nutritional needs which should be discussed with the patient.

When advising patients on dietary matters:

1. Be specific rather than general;
2. Encourage existing good nutritional habits;
3. Utilize existing food habits and cultural preferences to the best advantage; and
4. Be realistic and demand as few changes as possible to meet nutritional requirements.

The following section provides a guideline for nutritional assessment. While it neither outlines an assessment for each individual nutrient nor utilizes all nutritional assessment tools available, it does provide an adequate and convenient method for assessing pregnant and lactating women's nutritional needs.

Nutritional Assessment of Pregnant and Lactating Women

Several parameters should be evaluated when determining the nutritional status of your pregnant or lactating patients. The diet history and physical examination, while often more subjective, may provide information which is just as valuable as that from biochemical or anthropometric data. What information should you gather on your patient's first visit? On subsequent visits? Table 7–9 presents a timetable for appropriate nutritional assessment throughout pregnancy.

Anthropometric

Weight measurements throughout pregnancy will grossly evaluate nutritional intake and indicate inadequate or excessive intake of kilocalories. Adequate nutritional intake (particularly kilocalories, protein, and fluid) during lactation is measured indirectly through infant growth parameters. Inadequate maternal caloric reserves and/or intake will result in diminished milk production and thus inadequate growth of the infant.

Baseline anthropometric data are necessary to adequately evaluate nutritional status throughout the stress of pregnancy. An initial or preconceptional measurement of height and weight should be obtained and recorded, preferably on a weight grid such as the one shown in Figure 7–2. The preconceptional weight is plotted at zero pounds, zero weeks gestation. Subsequent weight gain is then plotted throughout pregnancy.

Table 7-9 Timetable for Assessing Nutritional Status

Nutritional Assessment Parameter	Months 3[a]	4	5	6	7	8	9
A. Anthropometric							
Height (refer to Table 7-10)	✓						
Weight (refer to Table 7-10 and to Figure 7-2)	✓	✓	✓	✓	✓	✓	✓
B. Biochemical serum (refer to Figure 7-2)							
Hemoglobin/Hematocrit	✓			✓			✓
Folic Acid	✓[b]			✓[b]			✓[b]
Vitamin B_{12}	✓[c]			✓[c]			✓[c]
Albumin	✓[d]			✓[d]			✓[d]
Total Protein	✓[d]			✓[d]			✓[d]
C. Physical	✓	✓	✓	✓	✓	✓	✓
D. Diet History (refer to Figures 7-3 and 7-4)							
24-Hour Food Intake Record	✓	✓	✓	✓	✓	✓	✓
Nutrition Questionnaire	✓						

[a]or initial visit
[b]optional since you will be supplementing with folic acid
[c]only for those who are vegetarians (excluding all meat, egg, and dairy products from diet)
[d]only in the presence of metabolic disease or for those who exclude most protein foods from the diet

Adapted from Corruccini, C.G. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

Table 7-10 Table of Standard Weight for Height

Height[a]		Weight[b]	
147 cm	4'10"	104*	47 kg
150 cm	4'11"	107	49 kg
152 cm	5' 0"	110	50 kg
155 cm	5' 1"	113	51 kg
157 cm	5' 2"	116	53 kg
160 cm	5' 3"	118	54 kg
162 cm	5' 4"	123	56 kg
165 cm	5' 5"	128	58 kg
167 cm	5' 6"	132	60 kg
170 cm	5' 7"	136	62 kg
172 cm	5' 8"	140	64 kg
175 cm	5' 9"	144	65 kg
177 cm	5'10"	148	67 kg
180 cm	5'11"	152	69 kg
182 cm	6' 0"	156	71 kg

[a]Height without shoes, plus 1 inch.
[b]Subtract 2 kilograms (5 pounds) for small frame; add 2 kilograms (5 pounds) for large frame.

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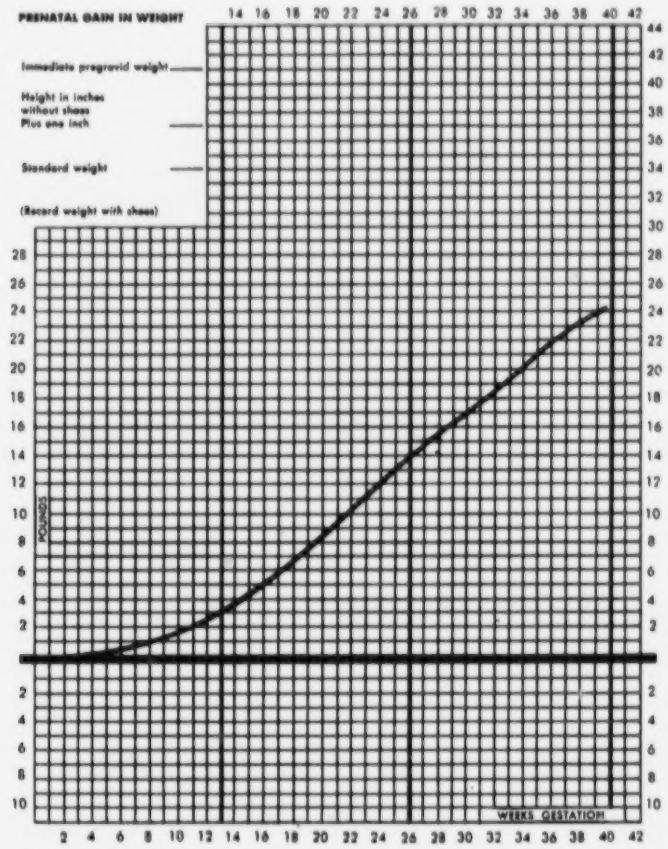
Figure 7–2 Prenatal Weight Gain Grid and Hematologic Values



From Lull, C.B. and Kimbrough, R.A.: *Clinical Obstetrics*. Philadelphia, J.B. Lippincott Company, 1953. Used with permission of J.B. Lippincott Company, © 1953, Philadelphia, PA.

HEMATOLOGIC VALUES				
Test	Desirable Value	Patient's Values		
		Date	Date	Date
Hematocrit	35%			
Hemoglobin	12 mg/100ml			
Serum folacin	6 ng/ml			
Other				

Sarah Jones, the patient who came to your office seeking medical advice during her pregnancy, weighed 59 kilograms (130 pounds) prior to conception. She is at an appropriate weight for a height of 168 centimeters (5 feet 6 inches). Refer to Table 7–10 for appropriate preconceptional weight for height. If Sarah were overweight or underweight, she would require nutritional counseling (see Appendix D).

Biochemical Assessment

Hemoglobin and hematocrit are biochemical values which should always be obtained on all pregnant women. Other biochemical values should be obtained as the physical examination and/or dietary history information warrant.

Although Sarah may be eating enough kilocalories (or more than enough) to achieve adequate weight gain, the foods supplying these kilocalories may or may not be rich in protein, vitamins, and minerals. Baseline hemoglobin and hematocrit values will provide information regarding iron, and, indirectly, protein status (see Table 7–9). Measurements after the first trimester should take into account the dilutional effect of increased plasma volume. This dilution can account for an apparent 10% decline in obtained values of hemoglobin and hematocrit.

If Sarah's hemoglobin is 10 grams per 100 milliliters, or her hematocrit level is less than 33%, an iron supplement of at least 60 milligrams daily is definitely warranted. You should also provide instruction regarding food sources of iron; this will prove to be of long-term benefit to both the patient and the patient's family. Supplementation with 30 to 60 milligrams of iron each day may be recommended even if the blood count is normal.

Due to the relatively high incidence of megaloblastic anemia among pregnant women, serum folic acid levels might be obtained initially and at each subsequent trimester. A serum value less than 3 milligrams per milliliter is considered deficient and warrants not only the standard supplementation with 400 to 800 μg of folic acid per day but also instruction regarding food sources (such as green leafy vegetables, meat, liver, and dried beans) for long-term benefit. With a view toward rising medical costs, this test should probably be done only if mean corpuscular volume (MCV) is greater than 95 cubic microns.

Diet History

A complete diet history may indicate potential nutritional deficiencies and reveal a base from which to start building dietary habits that will meet nutritional needs not only during pregnancy and lactation but throughout the entire lifecycle.

Although Sarah states she is fairly sure she eats a well-balanced diet, information obtained through a diet history is subjective at best. What does Sarah consider "balanced"? Are there other factors which can affect her nutritional status? Although a food record or 24-hour recall (see Figure 7–3) is necessary to assess nutritional intake (by comparison with Table 7–7, Daily Food Guide), neither can reveal other factors which may significantly contribute to nutritional status. Figure 7–4 attempts to reveal some of these factors such as:

- Who controls meal planning and food budget?
- What nutritional supplements are presently taken?
- Are there underlying nutritional problems?
- Is there evidence of pica (the ingestion of a nonfood substance which often chelates and thus increases the fecal excretion of minerals such as calcium, phosphorus, magnesium, and iron)?
- Are there plans to breast- or to bottle-feed the infant?

The food record (Figure 7–3) and the nutrition questionnaire (Figure 7–4) may be mailed by a member of your office staff to your patient prior to each visit. The record and questionnaire should be filled out by the patient at home and returned either by mail or at the time of the visit. The forms also could be completed during the visit, in the waiting room, with the help of your office staff.

Figure 7–3 24-Hour Food Record

Interviewer:_____

Patient's Name:_____ Date:_____

TIME	PLACE	FOOD EATEN	AMOUNT	SUMMARY					
				Protein Foods	Milk and Products	Grain Products	Vitamin C Products	Leafy Green or Orange Vegetables	Other Fruits & Vegetables
INFLUENCES ON DIET:			SUMMARY:						
			Svgs. eaten:						
			Svgs. needed	4	4	3	2	1	2
			Difference						

Adapted from Corruccini, C.G. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

Figure 7–4a Nutrition Questionnaire (in English)

NAME_____ DATE_____

Please answer the following by checking the appropriate box or filling in the blank. Answer only those questions which apply to you. All information is confidential.

1. a. Before this pregnancy, what was your usual weight?
   _____ Lbs. ☐ Don't know
   b. During your last pregnancy, how much weight did you gain?
   _____ Lbs. ☐ Don't know
   c. How much weight do you expect to gain during this pregnancy?
   _____ Lbs. ☐ Don't know
   d. Have you ever had any problems with your weight?
   ☐ Yes ☐ No
   If yes, what? ☐ Underweight ☐ Overweight ☐ Other
2. a. How would you describe your appetite?
   ☐ Hearty ☐ Moderate ☐ Poor
   b. With this pregnancy, have you experienced either of the following?
   ☐ Nausea ☐ Vomiting
3. a. How would you describe your eating habits?
   ☐ Regular ☐ Irregular
4. a. Indicate the person who does the following in your household:
   Plans the meals_____
   Buys the food_____
   Prepares the food_____
   b. How much is spent on food each week for your household?
   $_____ ☐ Don't know
   How many people does this feed? _____
   c. Indicate the types of kitchen equipment you have in your home:
   ☐ Refrigerator ☐ Stove
   ☐ Hot plate ☐ Other_____
5. a. Are you now taking any vitamin or mineral supplement?
   ☐ Yes ☐ No
   b. Do you take any pills to control your weight?
   ☐ Yes ☐ No
   c. Do you take diuretic (water) pills?
   ☐ Yes ☐ No
6. a. Are you now on a diet to lose weight?
   ☐ Yes ☐ No
   b. Are you now on a special diet (low salt, diabetic, gallbladder, etc.)?
   ☐ Yes ☐ No
   If yes, what kind of diet? _____
   c. If you have been on a special diet in the past, indicate what kind and when.
   _____
   _____
7. a. Is there any food you can't eat?
   ☐ Yes ☐ No
   If yes, what food? _____
   What happens when you eat this food? _____
   _____
   b. Do you have any cravings for things such as:
   ☐ Cornstarch
   ☐ Plaster
   ☐ Dirt or clay
   ☐ Ice
   ☐ Other _____
8. Do you have any of the following problems?
   ☐ Constipation
   ☐ Diarrhea
9. a. Do you smoke?
   ☐ Yes ☐ No
   b. Do you drink alcoholic beverages (liquor, wine, beer)?
   ☐ Yes ☐ No
10. Are you receiving either of the following?
    ☐ Food stamps
    ☐ WIC voucher
11. How do you want to feed your baby?
    ☐ Breast feed ☐ Commercial formula
    ☐ Evaporated milk formula ☐ Undecided

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Adapted from Corruccini, C.G. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

Figure 7–4b Nutrition Questionnaire (in Spanish)

NOMBRE_____ FECHA_____

Por favor conteste lo siguiente marcando el espacio entre paréntesis o llenando la línea en blanco. Conteste solamente esas preguntas que le conciernen a Ud. Toda la información es de caracter confidencial.

Solamente Para Uso de la Oficina

1. a. Antes de este embarazo, ¿cuál era su peso acostumbrado?
   _____ Lbs. ☐ No sé
   b. Durante su último embarazo, ¿cuánto aumentó de peso?
   _____ Lbs. ☐ No sé
   c. ¿Cuántas libras espera Ud. aumentar durante este embarazo?
   _____ Lbs. ☐ No sé
   d. ¿Ha tenido Ud. problemas con su peso?
   ☐ Sí ☐ No
   Si la respuesta es sí, ¿cuál?
   ☐ Peso insuficiente
   ☐ Peso excesivo
   ☐ Otro
2. a. ¿Cómo describiría Ud. su apetito?
   ☐ Grande ☐ Moderado ☐ Malo
   b. ¿Con este embarazo ha experimentado lo siguiente?
   ☐ Nausea ☐ Vómito
3. a. ¿Cómo describiría Ud. sus hábitos alimentarios?
   ☐ Regular ☐ Irregular
4. a. Indique la persona que se ocupa de lo siguiente en su casa:
   Planea las comidas_____
   Compra los alimentos_____
   Prepara los alimentos_____
   b. ¿Qué cantidad de dinero se gasta en comestibles todas las semanas en su casa?
   $_____ ☐ No sé
   ¿A cuántas personas alimenta esta cantidad? _____
   c. Indique las clases de aparatos de cocina que tiene en su casa:
   ☐ Refrigerador ☐ Estufa
   ☐ Estufita portátil ☐ Otro_____
5. a. ¿Está Ud. actualmente tomando suplementos de vitaminas o minerales?
   ☐ Sí ☐ No
   b. ¿Toma Ud. píldoras para controlar su peso?
   ☐ Sí ☐ No
   c. ¿Toma Ud. píldoras diuréticas (para el agua)?
   ☐ Sí ☐ No
6. a. ¿Está Ud. actualmente en dieta para rebajar de peso?
   ☐ Sí ☐ No
   b. ¿Está Ud. actualmente en una dieta especial? (Baja de sal, para diabéticos, vesícula biliar, etc.)
   ☐ Sí ☐ No
   Si la respuesta es sí, ¿qué clase de dieta? _____
   _____
   c. Si ha estado en una dieta especial anteriormente, indique qué clase y cuándo
   _____
   _____
7. a. ¿Hay algún alimento que Ud. no puede comer?
   ☐ Sí ☐ No
   Si la respuesta es sí, ¿qué alimento? _____
   ¿Qué sucede cuando come este alimento? _____
   _____
   b. Tiene Ud. antojos de comer cosas como:
   ☐ Almidón de harina
   ☐ Yeso
   ☐ Tierra o barro
   ☐ Hielo
   ☐ Otro _____
8. a. ¿Tiene Ud. alguno de los siguientes problemas?
   ☐ Estreñimiento
   ☐ Diarrea
9. a. ¿Ud. fuma?
   ☐ Sí ☐ No
   b. Toma Ud. bebidas alcohólicas? (Licor, vino, cerveza)
   ☐ Sí ☐ No
10. ¿Está Ud. recibiendo ayuda de cualquiera de los dos programas siguientes?
    ☐ Estampillas para alimentos
    ☐ Certificado para "WIC" (Suplemento alimentario para Mujeres, Infantes y Niños)
11. ¿Cómo desea Ud. alimentar a su niño?
    ☐ Amamantar ☐ Fórmula comercial
    ☐ Fórmula de leche evaporada ☐ Indecisa

Summary

The nutrient requirements for kilocalories, protein, vitamins, and minerals increase during pregnancy and lactation. Pregnant adolescents have especially high nutrient needs and should be counseled by a registered dietitian. The increased requirement for iron during pregnancy and lactation cannot be met by the iron intake of typical American diets, and therefore 30 to 60 milligrams of supplemental iron are recommended. A varied diet supplying 4 servings of animal and vegetable protein, 4 servings of milk and milk products, 3 servings of grain products, 2 servings of vitamin C-rich fruits and vegetables, 1 leafy green or orange vegetable, and 2 other fruits and vegetables will meet the nutrient needs of pregnant and lactating women. Routine salt restriction is not recommended during pregnancy.

Test Your Knowledge

In this final section of this module, use the following care study to apply what you have learned. Suggested answers are on pages 24 and 25.

Care Study

A patient, M.J., arrives for her first obstetrical appointment three months into her pregnancy. She is 21 years old and 5 feet 9 inches tall without shoes, and she weighs 148 pounds. She completes the nutrition questionnaire and 24-hour food record as shown in Figures 7–5 and 7–6. After reviewing the information given on those forms, answer the following questions:

1. What is M.J.'s caloric need?

2. What is M.J.'s recommended protein intake?

3. Does M.J.'s present diet appear to meet her needs for kilocalories and protein?

4. What food groups are inadequately represented in meeting the needs of pregnancy?

5. What nutrients are probably borderline or lacking in M.J.'s daily intake?

6. What dietary recommendations would you make if M.J. were Puerto Rican?

7. What biochemical tests will you perform at this time?

8. When will you start to educate M.J. about breastfeeding?

Figure 7–5 M.J.'s Nutrition Questionnaire

NAME M. J. DATE July 1, 1979

Please answer the following by checking the appropriate box or filling in the blank. Answer only those questions which apply to you. All information is confidential.

1. a. Before this pregnancy, what was your usual weight? (5'8" barefoot)
   142 Lbs. ☐ Don't know
   b. During your last pregnancy, how much weight did you gain?
   ____ Lbs. ☐ Don't know NA
   c. How much weight do you expect to gain during this pregnancy?
   ____ Lbs. ☑ Don't know
   d. Have you ever had any problems with your weight?
   ☐ Yes ☐ No
   If yes, what? ☐ Underweight ☑ Overweight (5-10#) ☐ Other
2. a. How would you describe your appetite?
   ☑ Hearty ☐ Moderate ☐ Poor
   b. With this pregnancy, have you experienced either of the following?
   ☑ Nausea ☑ Vomiting
3. a. How would you describe your eating habits?
   ☑ Regular ☐ Irregular
4. a. Indicate the person who does the following in your household:
   Plans the meals me
   Buys the food me
   Prepares the food me
   b. How much is spent on food each week for your household?
   $ 25-30 ☐ Don't know
   How many people does this feed? 2
   c. Indicate the types of kitchen equipment you have in your home:
   ☑ Refrigerator ☑ Stove
   ☐ Hot plate ☐ Other blender, toaster
5. a. Are you now taking any vitamin or mineral supplement?
   ☑ Yes ☐ No
   b. Do you take any pills to control your weight?
   ☐ Yes ☑ No
   c. Do you take diuretic (water) pills?
   ☐ Yes ☑ No
6. a. Are you now on a diet to lose weight?
   ☐ Yes ☑ No
   b. Are you now on a special diet (low salt, diabetic, gallbladder, etc.)?
   ☐ Yes ☑ No
   If yes, what kind of diet? ____
   c. If you have been on a special diet in the past, indicate what kind and when.
   ____
   ____
7. a. Is there any food you can't eat?
   ☐ Yes ☑ No
   If yes, what food? ____
   What happens when you eat this food? ____
   ____
   b. Do you have any cravings for things such as:
   ☐ Cornstarch
   ☐ Plaster
   ☐ Dirt or clay
   ☑ Ice
   ☐ Other ____
8. Do you have any of the following problems?
   ☑ Constipation occasionally
   ☐ Diarrhea
9. a. Do you smoke?
   ☐ Yes ☑ No
   b. Do you drink alcoholic beverages (liquor, wine, beer)?
   ☑ Yes ☐ No
10. Are you receiving either of the following?
    ☐ Food stamps
    ☐ WIC voucher
11. How do you want to feed your baby?
    ☑ Breast feed ☐ Commercial formula
    ☐ Evaporated milk formula ☐ Undecided

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Figure 7–6 M.J.'s 24-Hour Recall

Interviewer: _____

Patient's Name: M. J. Date: July 1, 1979

TIME	PLACE	FOOD EATEN	AMOUNT	Protein Foods	Milk and Products	Grain Products	Vitamin C Products	Leafy Green or Orange Vegetables	Other fruits & Vegetables
7:30A	home	cereal (bran chex)	1c.			1 c. B. Chex			
		milk (2%)	¾c.		¾ c. milk				
		toast (margarine, jelly)	1 slice			1 slice			
8:30A	work	coffee, doughnut	8oz., 1			1 donut			
		peanut butter/jelly sandwich							
		whole wheat bread	1 sandwich			2 sls. bread			
		water	8oz.						
		banana	1						1 banana
		lettuce salad, dressing	1c.	2 Tbsp. peanut butter					
2:00P	work	wheat crackers	1 bag		1 ice cream sandwich	1 bag crackers			
		ice cream sandwich	1						
8:00P	home	ground meat	5oz.	5. oz. beef		4 tortillas			
		tortillas	4		1 oz cheese				
		pinto beans	½ c.	½ c. beans		20 chips			1 c. salad
		cheddar cheese	1 oz.						
		tortilla chips	20						
		diet soft drink	16 oz.						
SUMMARY:				4	2	12	0	0	2
Svgs. eaten									
Svgs. needed				4	4	3	2	1	2
Difference									

INFLUENCES ON DIET:

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Resources for the Patient

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Answers

1. To have calculated M.J.'s kilocalorie need, you should have turned to Table 7–4. Her preconceptional caloric needs are approximately 2,000 kilocalories per day. Present need during pregnancy is thus 2,300 kilocalories per day. At 5 feet 9 inches without shoes, her ideal nonpregnant weight for height is 144 pounds. M.J. weighs 148 pounds which represents an acceptable weight gain at three months. Note that weight gain, though not excessive at this time, has been a problem in the past.
2. To ascertain M.J.'s recommended intake of protein, you should have turned to Table 7–1. Here you would have found that M.J., a mature 21-year-old female, should consume 1.3 grams protein per kilogram ideal body weight. Thus, at an ideal body weight of 144 pounds (65.5 kilograms) M.J.'s protein needs are 85 grams daily (65.5 kilograms × 1.3 grams protein per kilogram = 85 grams protein).
3. According to M.J.'s appropriate weight, it appears that she is receiving adequate kilocalories. If you were to calculate the amount of kilocalories in the 24-hour recall, you would find it to be approximately 2,400 kilocalories. M.J.'s intake of protein will be marginal. As you can see, she barely meets the meat recommendation and does not meet the milk recommendation, the latter of which is also an excellent source of protein. However, she eats many servings of grain products which add protein. A good practice M.J. has is to eat pinto beans and tortillas and tortilla chips at the same meal. This way the amino acids complement each other well and the protein improves in biological value. If M.J. would add 2 glasses of milk or 2 ounces of cheese to her intake, especially one serving at lunch to improve the biological value of the peanut butter sandwich, her intake of protein would be very good.
4. Refer to Table 7–7. Food groups for which inadequate intake occurred include the milk group, vitamin C-rich fruit and vegetable group, and leafy green or orange vegetable group.

5. Refer to the section Meeting Nutritional Needs During Pregnancy and Lactation. Borderline intake is probable for protein, calcium, vitamin D, and riboflavin (all found in milk which 1 to 2 servings per day would correct), vitamin C (which 1 citrus fruit daily would correct), folic acid and vitamin A (which 1 leafy green or 1 deep orange vegetable would correct). Iron is probably also low (correctable with supplemental iron).

6. Recommend to the Puerto Rican the following points (refer to Appendix B and Appendix C, Table 7–13):

   a. Increase milk or cheese intake by two servings per day.

   b. Include a salad at the evening meal.

   c. Include a vitamin C-rich fruit such as a mango or guava at the morning snack in place of the donut.

   d. Add a vegetable at the lunch meal or at the evening meal.

   e. Supplement with 30 to 60 milligrams of iron and 400 micrograms of folic acid.

7. Refer to Table 7–9. At this time, obtain a hemoglobin and hematocrit value. You may also want to do a serum folic acid test if MCV is abnormal. Sources of protein in the diet do not appear low enough to warrant serum albumin or tests for total protein and vitamin B_{12}.

8. Refer to Appendices E and F. It is time *now* to begin education concerning breastfeeding. Breast-care and breastfeeding information should be given with demonstrations on breast care begun six to eight weeks before the expected date of confinement. Discussion of problems which may be encountered with breastfeeding need not be done until post partum.

Appendix A

Table 7–11 Recommended Nutrient Allowances for Females of Childbearing Age During Pregnancy and Lactation

	Age in Years					
	11–14	5–18	19–22	23–50	Pregnancy	Lactation
Kilocalories	55 kcal/kg	40 kcal/kg	35 kcal/kg	30 kcal/kg	+300	+500
protein	1.0 gm/kg	0.9 gm/kg	0.8 gm/kg	0.8 gm/kg	[a]	+ 20 gm
vitamin A (R.E.)	800	800	800	800	1,000	1,200
vitamin D (IU)	400	400	300	200	+200	+200
vitamin E (IU or T.E.)	8	8	8	8	10	11
ascorbic acid (mg)	50	60	60	60	+ 20	+ 40
folacin (µg)	400	400	400	400	800	500
niacin (mg)	15	14	14	13	+ 2	+ 5
riboflavin (mg)	1.3	1.3	1.3	1.2	+0.3	+0.5
thiamin (mg)	1.1	1.1	1.1	1.0	+0.4	+0.5
vitamin B_6 (mg)	1.8	2.0	2.0	2.0	+0.6	+0.5
vitamin B_{12} (µg)	3.0	3.0	3.0	3.0	4.0	4.0
calcium (mg)	1,200	1,200	800	800	+400	+400
phosphorus (mg)	1,200	1,200	800	800	+400	+400
iodine (µg)	150	150	150	150	175	200
iron (mg)	18	18	18	18	[b]	[b]
magnesium (mg)	300	300	300	300	450	450
zinc (mg)	15	15	15	15	20	25

[a] See Table 7–1.
[b] The increased requirement during pregnancy cannot be met by the iron content of habitual American diets or by the existing iron stores of many women; therefore, the use of 30 to 60 mg supplemental iron is recommended. Iron needs during lactation are not substantially different from those of non-pregnant women, but continued supplementation of the mother for two to three months after parturition is advisable in order to replenish stores depleted by pregnancy.

Adapted from *Recommended Dietary Allowances*, 9th ed. Washington, DC, National Academy of Sciences, 1980.

Appendix B

Foods Classified According to Food Groups Which Meet the Daily Food Guide Recommendations Shown in Table 7–7

Protein Food Group

Protein foods include both animal and vegetable foods. Animal protein foods supply protein, iron, thiamin, riboflavin, vitamin B_6 and B_{12}, phosphorus, zinc, and iodine. Vegetable protein foods supply protein, iron, thiamin, folacin, vitamins B_6 and E, phosphorus, magnesium, and zinc.

Animal Protein Foods:

A serving is a 2 to 3 ounce (60 to 90 gram) cooked (boneless) piece of the following unless otherwise noted and will supply 14 to 16 grams of protein.

Bacon, 6 slices
Beef: ground, cube, roast, steak
Canned tuna, salmon, crab, etc., 1/2 cup
Cheese (see Milk)
Chitterlings (tripe)
Clams, 4 large or 9 small
Crab
Duck
Eggs, 2
Fish: fillet, steak
Fish sticks, breaded, 4
Frankfurters, 2
Hogmaws
Lamb: ground, cube, roast, chop
Lobster
Luncheon meat, 3 medium slices
Organ meats: liver, kidney, sweetbreads, heart, tongue
Oysters, 10 to 15 medium
Pig's ears
Pig's feet
Pig's snouts
Pork, ham: ground, roast, chopped, steak
Poultry: ground, roast
Rabbit
Sausage links, 4
Shrimp, scallops, 5 to 6 large
Spareribs, 6 medium ribs
Veal: ground, cube, roast, chopped, steak

Vegetable Protein Foods:

A serving is 1 cup cooked unless otherwise stated and will supply 14 to 16 grams of protein.

Canned garbanzo, lima, kidney beans
Canned pork and beans
Dried beans and peas, cooked
Lentils
Nut butters, 1/4 cup
Nuts, 1/2 cup
Sunflower seeds, 1/2 cup
Tofu (soybean curd)

Milk and Milk Products Group

An exchange group for foods containing calcium, phosphorus, vitamin D, and riboflavin. In addition, these foods supply protein, vitamins A, E, B_6, and B_{12}, magnesium, and zinc. For some people, milk and milk products serve as the primary source of protein in the diet. A serving is 8 ounces (1 cup or 240 cc) unless otherwise noted and will supply 8 grams of protein.

Cheese: hard and semisoft (except bleu, camembert, and cream), 1½ ounce
Cheese spread, 2 ounces
Cottage cheese, creamed, 1½ cups
Cow's milk: whole, nonfat, low fat, nonfat dry reconstituted, buttermilk, chocolate milk, cocoa made with milk
Cream soups made with milk, 12 ounces
Evaporated milk, 3 ounces
Goat's milk (low B_{12} content)
Ice cream, 1½ cups
Ice milk
Instant breakfast made with milk, 4 ounces
Liquid diet beverage, 5 ounces
Milkshake, commercial, 8 ounces
Puddings, custard (flan)
Soybean milk (low B_{12} content)
Yogurt

NOTE: Tofu is also a source of calcium; 1 cup tofu may be exchanged for one serving of the above foods.

Grain Products Group

These supply thiamin, niacin, riboflavin, iron, phosphorus, and zinc. This exchange group is divided into two parts: whole grain items and enriched products. Whole grain items and enriched items are equally nutritious in the major nutrients these products supply with the exception of fiber which is higher in whole grain products compared to enriched products.

Whole Grain Items

Brown rice, 1/2 cup
Cereals, hot: oatmeal (rolled oats), rolled wheat, cracked wheat, wheat and malted barley, 1/2 cup cooked
Cereals, ready to eat: puffed oats, shredded wheat, wheat flakes, granola, 3/4 cup
Cracked and whole wheat bread, 1 slice
Wheat germ, 1 tablespoon

Enriched Breads, Cereals, and Pastas

Note: Most (37 of 50) but not all states in the United States require that bread and bakery products be made with enriched flours.

Bread, 1 slice (all other forms)
Cereals, hot: cream of wheat, cream of rice, farina, cornmeal, grits, 1/2 cup
Cereals, ready to eat, 3/4 cup
Cornbread, 1 piece (2" square)
Crackers, 4 (all kinds)
Macaroni, noodles, spaghetti, cooked, 1/2 cup
Muffin, biscuit, dumpling, 1
Rice, cooked, 1/2 cup
Roll , bagel, 1
Tortilla, corn, 2
Tortilla, flour, 1 large
Waffle, 1 large

Vitamin C-Rich Fruit and Vegetable Group

These supply ascorbic acid. Fresh, frozen, or canned forms may be used.

Juices:

Orange, grapefruit, 4 ounces
Tomato, pineapple, 12 ounces
Fruit juices and drinks enriched with vitamin C, 6 ounces

Fruits:

Cantaloupe, 1/2
Grapefruit, 1/2
Guava, 1/4 medium
Mango, 1 medium
Orange, 1 medium
Papaya, 1/3 medium
Strawberries, 3/4 cup
Tangerine, 2 small

Vegetables:

Bok choy, 3/4 cup
Broccoli, 1 stalk
Brussels sprouts, 3-4
Cabbage, cooked, 1 1/3 cups
Cabbage, raw, 3/4 cup
Cauliflower, raw or cooked, 1 cup
Greens: collard, kale, mustard, Swiss chard, turnip greens, 3/4 cup
Peppers, chili, 3/4 cup
Peppers: green, red, 1/2 medium
Potatoes, 1 large
Tomatoes, 2 medium
Watercress, 3/4 cup

Leafy Green and Orange Vegetable Group

These foods supply large amounts of vitamin A, and folic acid, and also vitamins E, B_6 and riboflavin, iron, and magnesium. A serving is 1/2 cup raw or 1/2 to 3/4 cup cooked.

- Asparagus
- Bok choy
- Broccoli
- Brussels sprouts
- Carrot
- Dark leafy lettuce: chicory, endive, escarole, red leaf, romaine
- Greens: beet, collard, kale, mustard, spinach, Swiss chard, turnip
- Summer squash, winter squash
- Sweet potato
- Yams
- Pumpkin, a fruit, is also high in vitamin A

Other Fruits and Vegetables Group

These include fruits and vegetables which also supply a fairly high amount of vitamins A and C. Other fruits and vegetables also contribute varying amounts of B-complex vitamins, vitamin E, magnesium, zinc, and phosphorus.

A serving is 1/2 cup (fresh, frozen, or canned) unless otherwise indicated.

Vegetables:

- Artichoke
- Bamboo shoots
- Bean sprouts: alfalfa, mung
- Beet
- Burdock Root
- Cabbage
- Cauliflower
- Celery
- Corn
- Cucumber
- Eggplant
- Beans: green, wax
- Hominy
- Lettuce: head, boston, bib
- Mushrooms
- Nori seaweed
- Onion
- Parsnip
- Peas
- Pea pods
- Radishes
- Scallions
- Watercress
- Zucchini

Fruits:

- Apricot, fresh, 1 large
- Nectarines, 2 medium
- Peach, fresh, 1 medium
- Prunes, 4 (also significant iron source)
- Apple, 1 medium
- Banana, 1 small
- Berries
- Cherries
- Dates, 5
- Figs, 2 large
- Fruit cocktail
- Grapes
- Kumquats, 3
- Pear, 1 medium
- Pineapple
- Plums, 2 medium
- Raisins (also significant iron source)
- Watermelon

Adapted from Corruccini, C.G. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

Appendix C

Table 7–12 Complementary Plant Protein Sources

Food	Amino Acids Deficient	Complementary Protein
Grains	Isoleucine Lysine	Rice + legumes Corn + legumes Wheat + legumes Wheat + peanut + milk Wheat + sesame + soybean Rice + sesame Rice + Brewer's yeast
Legumes	Tryptophan Methionine	Legumes + rice Beans + wheat Beans + corn Soybeans + rice + wheat Soybeans + corn + milk Soybeans + wheat + sesame Soybeans + peanuts + sesame Soybeans + peanuts + wheat + rice Soybeans + sesame + wheat
Nuts and Seeds	Isoleucine Lysine	Peanuts + sesame + soybeans Sesame + beans Sesame + soybeans + wheat Peanuts + sunflower seeds
Vegetables	Isoleucine Methionine	Lima beans, Green peas, Brussels sprouts, Cauliflower, Broccoli + sesame seeds or Brazil nuts or mushrooms Greens + millet or converted rice

Adapted from Lappé, F.M.: *Diet for a Small Planet*. New York, Friends of the Earth Ballantine, 1971. From Corruccini, C.G. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

Table 7-13 Vegetarian Food Guide

1. Follow guidelines as given in Table 7-7, choosing eggs, milk and milk products, and/or appropriate vegetables to provide adequate amounts of protein.

2. If milk and milk products are excluded from diet, include soy milk and/or supplement daily with:

   4 µg vitamin B_{12}
   250 - 500 mg calcium
   400 I.U. vitamin D

3. Supplement with 30 to 60 mg elemental iron and 800 µg folacin as with non-vegetarian diets.

4. Use iodized salt.

Adapted from Corruccini, C.G. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

Table 7–14 Characteristic Mexican-American Food Choices

Protein Foods	Milk and Milk Products	Grain Products	Vegetables	Fruits	Other
Meat:	Milk:	Rice	Avocado	Apple	Salsa
Beef	Fluid	Tortillas:	Cabbage	Apricots	(Tomato-pepper onion relish)
Pork	Flavored	Corn	Carrots	Banana	Chili sauce
Lamb	Evaporated	Flour	Chilies	Guava	Guacamole
Tripe	Condensed	Oatmeal	Corn	Lemon	Lard (manteca)
Sausage (chorizo)		Dry cereals:	Green beans	Mango	Pork cracklings
Bologna	Cheese:	Cornflakes	Lettuce	Melons	Fruit drinks
Bacon	American	Sugar coated	Onion	Orange	Kool-aid
Poultry:	Monterey jack	Noodles	Peas	Peach	Carbonated beverages
Chicken	Hoop	Spaghetti	Potato	Pear	Beer
Eggs		White bread	Prickly Pear Cactus leaf (nopales)	Prickly Pear Cactus fruit (tuna)	Coffee
Legumes:	Ice cream	Sweet bread (pan dulce)	Spinach	Zapote (or sapote)	
Pinto beans			Sweet potato		
Pink beans			Tomato		
Garbanzo beans			Zucchini		
Lentils					
Nuts:					
Peanuts					
Peanut butter					

Table 7–15 Characteristic Black American Food Choices

Protein Foods	Milk and Milk Products	Grain Products	Vegetables	Fruits	Other
Meat:	Milk:	Rice	Broccoli	Apple	Salt pork
Beef	Fluid	Cornbread	Cabbage	Banana	Carbonated beverages
Pork and ham	Evaporated in coffee	Hominy grits	Carrots	Grapefruit	Fruit drinks
Sausage	Buttermilk	Biscuits	Corn	Grapes	Gravies
Pigs feet, ears, etc.		Muffins	Green Beans	Nectarine	
Bacon	Cheese:	White bread	Greens:	Orange	
Luncheon meat	Cheddar	Dry cereal	Mustard	Plums	
Organ meats	Cottage	Cooked cereal	Collard	Tangerine	
Poultry:		Macaroni	Kale	Watermelon	
Chicken	Ice cream	Spaghetti	Spinach		
Turkey		Crackers	Turnips, etc.		
Fish:			Lima beans		
Catfish			Okra		
Perch			Peas		
Red snapper			Potato		
Tuna			Pumpkin		
Salmon			Sweet potato		
Sardines			Tomato		
Shrimp			Yam		
Eggs					
Legumes:					
Kidney beans					
Red beans					
Pinto beans					
Black-eyed peas					
Nuts:					
Peanuts					
Peanut butter					

Table 7-16 Characteristic Japanese-American Food Choices

Protein Foods	Milk and Milk Products	Grain Products	Vegetables	Fruits	Other
Meat:	Milk	Rice	Bamboo shoots	Apple	Soy sauce
Beef	Ice cream	Rice crackers	Bok choy	Apricot	Nori paste
Pork	Cheese	Noodles	Broccoli	Banana	(used to
Poultry:		(whole wheat	Burdock root	Cherries	season rice)
Chicken		noodle called	Cabbage	Grapefruit	Bean thread
Turkey		soba)	Carrots	Grapes	(konyaku)
Fish:		Spaghetti	Cauliflower	Lemon	Ginger
Tuna		White bread	Celery	Lime	(shoga; dried
Mackerel		Oatmeal	Cucumbers	Melons	form called
Sardines		Dry cereals	Eggplant	Orange	denishoga)
(dried form		(nisei only)	Green beans	Peach	Tea
called mezashi)			Gourd (kampyo)	Pear	Coffee
Sea bass			Mushrooms	Persimmon	
Shrimp			Mustard greens	Pineapple	
Abalone			Napa cabbage	Pomegranate	
Squid			Peas	Plums	
Octopus			Peppers	(dried pickled	
Eggs			Radishes	plums called	
Legumes:			(white radish	umeboshi)	
Soybean curd			called daikon;	Strawberries	
(tofu)			pickled white	Tangerine	
Soybean paste			radish called		
(miso)			takawan)		
Soybeans			Snow peas		
Red beans			Spinach	Vegetables:	
(azuki)			Squash	Turnips	
Lima beans			Sweet potato	Water chestnuts	
Nuts:			Taro (Japanese	Yam	
Chestnuts			sweet potato)		
(kuri)			Tomato		

Table 7–17 Characteristic Filipino-American Food Choices

Protein Foods	Milk and Milk Products	Grain Products	Vegetables	Fruits	Other
Meat:	Milk:	Rice	Bamboo shoots	Apple	Soy sauce
Pork	Flavored	Cooked cereals:	Beets	Banana	Coffee
Beef	Evaporated	Farina	Cabbage	Grapes	Tea
Goat		Oatmeal	Carrots	Guava	
Deer	Cheese:	Dry cereals	Cauliflower	Lemon	
Rabbit	Gouda	Pastas	Celery	Lime	
Variety meats	Cheddar	Rice noodles	Chinese celery	Mango	
Poultry:		Wheat noodles	Eggplant	Melons	
Chicken		Macaroni	Endive	Orange	
Fish:		Spaghetti	Green beans	Papaya	
Sole			Leeks	Pear	
Bonito			Lettuce	Pineapple	
Herring			Mushrooms	Plums	
Tuna			Okra	Pomegranate	
Mackerel			Onion	Rhubarb	
Crab			Peppers	Strawberries	
Mussels			Potato	Tangerine	
Shrimp			Pumpkin		
Squid			Radishes		
Eggs			Snow peas		
Legumes:			Spinach		
Black beans			Squash		
Chick peas			Sweet potato		
Black-eyed peas			Tomato		
Lentils			Water chestnuts		
Mung beans			Watercress		
Lima beans			Yam		
White kidney beans					
Nuts:					
Cashews					
Peanuts					
Pili nuts					

Table 7–18 Characteristic Chinese-American Food Choices

Protein Foods	Milk and Milk Products	Grain Products	Vegetables	Fruits	Other
Meat:	Flavored milk	Rice	Bamboo shoots	Apple	Soy sauce
Pork	Milk (cooking)	Noodles	Beans:	Banana	Sweet and
Beef	Ice cream	White bread	green	Figs	sour sauce
Organ meats		Barley	yellow	Grapes	Mustard sauce
		Millet	Bean sprouts	Kumquats	Ginger
Poultry:			Bok choy	Loquats	Plum sauce
Chicken			Broccoli	Mango	Red bean paste
Duck			Cabbage	Melons	Tea
			Carrots	Orange	Coffee
Fish:			Celery	Peach	
White fish			Chinese cabbage	Pear	
Shrimp			Corn	Persimmon	
Lobster			Cucumbers	Pineapple	
Oyster			Eggplant	Plums	
Sardines			Greens:	Tangerine	
			collard		
Eggs			Chinese broccoli		
			mustard	Vegetables:	
Legumes:			kale	Snow peas	
Soybeans			spinach	Sweet potato	
Soybean curd (tofu)			Leeks	Taro	
Black beans			Lettuce	Tomato	
			Mushrooms	Water chestnuts	
Nuts:			Peppers	White radishes	
Peanuts			Potato	White turnip	
Almonds			Scallions	Winter melon	
Cashews					

Tables 7–14 through 7–18 used with permission of Corruccini, C. and Cruskie, P.E.: *Nutrition During Pregnancy and Lactation*. California Department of Health, 1975.

Appendix D

Table 7-19 Common Problems in Pregnancy, Possible Causes and Helpful Dietary Treatment

Symptoms	Cause
nausea and vomiting	hormone changes
heartburn	weight redistribution causing pressure on stomach and gastroesophageal reflux
constipation	decreased fluid intake, decreased gastric motility, decreased physical activity, weight redistribution, iron supplements
hemorrhoids	weight redistribution
inadequate weight gain	preconceptional weight 10% or more below ideal weight for height; excessive concern for gaining too much weight or for maintaining preconceptional weight; hormone changes and appetite discrepancies; excessive vomiting
obesity	preconceptional obesity; excessive weight gain during pregnancy; caloric intake greater than caloric expenditure

Table 7-19 (continued)

Dietary Treatment
Small frequent meals; keep crackers at bedside to eat before rising; avoid specific foods causing nausea (often spicy foods or foods high in fat content).
Small frequent meals; avoid foods that cause excessive gas production (varies with individuals although often vegetables of the cabbage, onion, and bean or lentil families and spicy foods cause gas).
Increase fluid intake; increase physical activity if possible; avoid foods which may contribute to constipation (varies with individuals, although often cheese, bananas, iron sulfate); encourage bran and whole grain products, fruit and fruit juices.
May temporarily decrease bulk in diet. Avoid fresh fruit and vegetables, whole grains, skins, seeds, and hulls; include in diet cooked fruits, vegetables, and juices to ensure meeting vitamin needs· provide high liquid intake.
Small frequent meals; foods high in kilocalories, and low in bulk such as milk-shakes, puddings, cream pies, ice cream, cheese cake, etc.; counseling regarding importance of adequate weight gain to fetal outcome.
Allow enough kilocalories for 10 to 12 kg (22 to 27 lb) weight gain (1 to 2 kg or 2 to 5 lb weight gain during first trimester and 0.4 kg or nearly 1 lb weight gain per week during last 2 trimesters); incidence of morbidity increases when weight gain exceeds 18 kg (40 lbs). Encourage foods high in nutrient content and low in kilocalories, such as fresh fruits and vegetables, foods broiled or baked rather than fried, low-fat milk, etc.

Table 7-19 (continued)

Symptoms	Cause
diabetes mellitus	class A - gestational diabetes class B - onset after age 20, less than 10 years duration; insulin dependent class C - onset age 10 to 20 or 10 to 20 years duration; insulin dependent class D - onset before 10 years of age or duration greater than 20 years; insulin dependent fasting blood glucose > 100 mg%; postprandial blood glucose > 120 mg%
anemia	inadequate store or intake of iron and/or folacin; blood levels: hematocrit <30% or hemoglobin <10 grams/100 ml/ folacin < 3 mg/ml
preeclampsia or eclampsia	systemic disease
tobacco or alcohol or drug abuse	varied

Table 7-19 (continued)

Dietary Treatment
1) Screen all patients under 25 years of age with suggestive history; screen all patients over 25 years of age. 2) Diet to provide adequate kilocalories (see Table 7-4). 3) Diet to provide 20% protein/kilocalories. 40 to 45% carbohydrate kilocalories (low in simple sugars), and 35 to 40% fat kilocalories. 4) Diet to provide relatively equal distribution of kilocalories throughout day (24% breakfast, 30% lunch, 33% dinner, 13% evening snack). 5) Diet to provide relatively equal distribution of carbohydrate, protein, and fat at each meal. 6) May need to hospitalize to obtain good glucose control needed during pregnancy.
Supplement with 30 to 60 mg of elemental iron and 400 to 800 µg of folacin daily.
1) The most important aspect of care is bed rest. 2) You may choose also to: Limit sodium intake to no less than 2 gm/day; monitor for symptoms of sodium depletion.
1) Monitor for signs of nutritional deficiency as intake may be mildly to severely impaired and metabolism of various nutrients may be altered. 2) Encourage appropriate protein and kilocalorie intake. 3) Suggest protein, vitamin, and mineral supplements. 4) Strongly order patient to stop the abuse with an explanation as to the damage which may occur to both baby and mother; offer ideas to help stop the abuse.

Appendix E

Table 7–20 Practicalities of Breastfeeding

Symptoms	Cause
Sore, cracked nipples	Infant "chewing" on nipples that are inadequately protractile; infant sucking too vigorously; use of soap or antiseptic to cleanse nipples; constant moisture surrounding nipple; nursing too long at one breast.
Sore breasts, "caking"	Insufficient emptying; excessive pressure of bra of one or more alveoli; engorgement.
Mastitis	Acquired bacterial infection directly by mother or indirectly from infant.

Table 7-20 (continued)

Prevention/Treatment
Prenatal exercise: grasp nipple gently with thumb and forefinger, drawing nipple out just to point of discomfort, and release; repeat 5 to 6 times, several times daily. If engorged: manually express about a teaspoon of milk to allow infant a more efficient grasp of nipple area; feed on demand rather than on rigid schedule; initially nurse 5 minutes at each breast; each feeding gradually increase to no more than 15 minutes at each breast. Position infant comfortably within easy grasp of nipple; release suction by pressing gently with forefinger on breast near corner of baby's mouth before taking baby from breast. Wash nipples with clean water (avoid soap and antiseptics); allow nipples to air dry after bath or shower and after each feeding; place absorbent woven cotten material (e.g., man's handkerchief, folded) in bra to absorb leakage and promote drying (avoid plastic liners in bra). Moisten cloth liner before removing to prevent pulling of skin. Take a warm shower; apply a warm moist towel to affected nipple before nursing, and/or nurse on unaffected nipple first to initiate let down, thereby avoiding discomfort associated with negative pressure caused by sucking prior to let down. Apply dry heat (a 60-watt bulb at approximately 18") for 20-minute intervals several times daily; use glass or plastic nipple shield (avoid rubber as it pulls on skin tissue) if necessary, but preferably only during initial vigorous sucking. As a last resort, take infant off affected breast for no more than 24 to 48 hours, then resume nursing with the above guides.
Completely empty both breasts at each feeding, or if second breast is not completely emptied, start with second breast at next feeding; completely empty manually or with breast pump if necessary. Wear a comfortably loose but supportive bra. Apply warm, moist heat to affected breast before nursing to open ducts and loosen dried, caked milk (start with unaffected breast to initiate let down in affected breast); manually express about a teaspoon of milk before baby is put to breast; nurse more frequently for shorter periods of time.
Continue to breast feed (to discontinue breastfeeding may cause engorgement, stasis, enhance the infection, and may lead to breast abscess); take precautions listed under "sore breasts"; mandatory bed rest; prescribe antibiotic within 24 hours for a minimum 10-day course (avoid sulfa drugs if infant is 1 month of age or less); encourage fluids; advise aspirin for discomfort.

Table 7-20 (continued)

Symptoms	Cause
Insufficient milk	Maternal causes: delayed institution of nursing; infrequent or incomplete emptying of breast; supplemental bottle or spoon feedings during initial establishment of milk supply or during growth spurts; inadequate maternal fluid intake; maternal exhaustion; maternal stress; maternal antihistamines, birth control pills, diuretics; do not assume reduction in breast size indicates inadequate milk production (there is a normal swelling of breast tissue during the first 1 to 2 weeks which subsequently subsides). Infant causes: infant does not suck vigorously during initial feedings; infant sleeps during feeding; infant too active at feeding to nurse efficiently.
Colic, "fussiness," or refusal to nurse	Rigid feeding schedule not coinciding with infant's hunger signals; growth spurts increasing demand above supply; drug, caffeine, or specific food ingested by mother; other discomfort (soiled diaper, loneliness, rash, etc.); maternal menstruation.
Maternal illness	Varied
Infant diarrhea/constipation	Misinterpretation of normal initial breast milk stools for diarrhea and later stools for constipation based on frequency rather than consistency.
Engorgement during weaning	Rapid weaning.

Table 7-20 (continued)

Prevention/Treatment
Initial nursing should occur during first hour post partum (infant most alert at this time) with infant placed at mother's side, positioned for warmth, comfort, and facilitation of nursing, using warming lights to provide neutral-thermal environment. (Contraindications are heavily sedated mother, infant Apgar score 6 or less at 5 minutes, infant 36-weeks gestation or less, infant with gastrointestinal tract anomalies--may be ruled out by obtaining gastric aspirate) infant with respiratory distress. If early nursing must be delayed, manual or pump expression is recommended. Nurse on demand rather than on a rigid schedule; nurse more frequently (at least every 2 hours during day, every 3 hours at night). Frequently stimulate and empty the breast to facilitate milk production; completely empty both breasts at each feeding, or if second breast is not completely emptied, begin with that breast at next nursing. Avoid supplemental bottles during first weeks (it may take 72 to 96 hours for milk to come in)unless infant loses 10% of birthweight and/or does not regain birthweight by 2 weeks of age; avoid supplemental bottles during growth spurts (nurse more frequently for several days to increase milk supply); avoid spoon feeding until 6 months of age. Maternal fluid intake should be at least 2 liters/day; schedule naps and/or relaxation periods for mother; involve family in allowing mother rest and relaxation. Avoid antihistamines, birth control pills, and diuretics during initial weeks of nursing. Each infant develops his own pattern of nursing and some take longer to initiate vigorous sucking (usually no longer than 3 to 4 days). Stimulate sleepy infant by washing infant's face, changing diaper, stroking cheek with nipple to initiate rooting. Very active infants may need calming social interaction before feeding to nurse efficiently.
Feed on demand; increase frequency of nursing to stimulate increase in milk supply to meet demands of growth spurts; avoid caffeine containing beverages, specific drugs and foods which seem to affect infant (effects of foods should subside within 24 hours). Satisfy infant's other needs of comfort and cuddling; continue to offer breast during menstruation (the infant will soon adjust); continue to offer both breasts, even if one is refused or rejected, holding infant in same position with same side toward mother for both breasts; apply honey to nipple refused; use precautions for sore, cracked nipples for rejected breast; if rejection continues, rule out breast mass or tumor. Allergy to breast milk is extremely rare and symptoms are usually due to diaper or clothes laundering technique or other foods given to infant.
Do not discontinue nursing (except in extreme circumstances, in which case pumping may be instituted to maintain flow of milk); infant has generally been exposed to pathogen before maternal symptoms appear.
Normal stools are varied in color and consistency, but are usually yellow to green, seedy to mushy, and very frequent (3 to 6 daily) initially becoming much less frequent (1 every 1 to 3 days) and more firm after 6 weeks of age.
Omit one feeding at a time every 4 to 5 days; express about a teaspoon at this feeding if discomfort occurs.

Appendix F

Table 7-21 Use of Drugs in Breastfeeding Mothers

Caution: Drugs of any kind should be used with great discretion and careful weighing of the risks versus the potential benefits.

Analgesics and Anti-Inflammatory Agents

Narcotics

Codeine - no hazard to infant in usual doses.
Methadone - may breastfeed during methadone maintenance.
Morphine - no hazard to infant in usual doses.
Propoxyphene - may be excreted in significant amounts, but no effects are reported in infants.

Non-Narcotics and Anti-Inflammatory Agents

Acetaminophen - not studied, but long history of safe use in infants.
Aspirin - occasional use considered safe.
Gold - excreted in small amounts, found in infant's serum and urine; may be reason for withholding breastfeeding.
Indomethacin - one case of seizures occurred in otherwise normal infant.
Phenylbutazone - passes in low levels; theoretical possibility of blood dyscrasias.

Anti-Infective Agents

Aminoglycosides - little data, but kanamycin does appear in significant levels; possibility of fungal overgrowth of gastrointestinal tract.
Chloramphenicol - breastfeeding probably not advisable because of potential bone marrow toxicity. Miscellaneous gastrointestinal and behavioral problems also reported.
Penicillins - serious immediate risks to infant are minimal, but allergic sensitization and fungal overgrowth of gastrointestinal tract may occur.
Sulfonamides - not absolutely contraindicated, but caution should be used. Hemolysis in G-6-PD deficient infants has occurred. Jaundice due to displacement of bilirubin from plasma proteins may occur, especially with long-acting drugs.
Tetracyclines - hazards exist and alternative drugs are available for most maternal infections.

Urinary Germicides

Nalidixic Acid - hemolysis has occurred; should be avoided.
Nitrofurantoin - levels insignificant with possible exception of G-6-PD deficient infants.

Table 7-21 (continued)

Anticoagulants

Heparin - does not appear in milk.
Warfarin - excreted in amounts too small to cause harm.
Other - older coumarins and indanediones have caused bleeding in infants.

Anticonvulsants

Carbamazepine - significant amounts of drug and major metabolite excreted; clinical significance is unknown.
Phenytoin/phenobarbital - excreted in small amounts that may cause hepatic enzyme induction. Cyanosis and methemoglobinemia reported in one case attributed to phenytoin, but severe acute effects are rare.

Antineoplastic Agents

In general, breastfeeding is contraindicated with these agents.
Cyclophosphamide - neutropenia in infant reported.
Methotrexate - very small amounts excreted.

Bronchodilators

Aminophylline - one case of irritability and distorted sleep reported, but safe in most cases.
Iodides - contraindicated; thyroid suppression may occur.
Sympathomimetics - not studied, but use of inhalers should minimize amount in milk.

Cardiovascular Agents

Digoxin - measurable, but clinically insignificant amounts.
Propranolol - excreted in insignificant levels.
Reserpine - may cause nasal stuffiness; its use is not recommended.

Diuretics

Chlorthalidone - appears in low levels, but it may accumulate because of long half-life.
Thiazides - some agents have been used to suppress lactation in lieu of estrogens; doubtful if pharmacologically significant amounts appear in milk.
Spironolactone - doubtful if significant amounts of drug or metabolite appear in milk, but still be very cautious.

Table 7-21 (continued)

Ergot Alkaloids

Bromocriptine - used to suppress lactation.
Ergot - older, crude ergot preparations have caused toxicity in infants.
Ergotamine - not studied, but caution should be observed during long-term use, as in migraine.
Ergonovine - short post-partum course probably presents no problems.
Methylergonovine - short post-partum course probably presents no problems.

Laxatives

Bulk forming, stool softening and saline types safe; some anthraquinones (cascara, danthron) should be avoided, but others (aloe, senna) cause problems only in high doses and are generally safe.

Hormones

Corticosteroids - not studied sufficiently to make definitive statement, but long-term or high-dose use may cause problems. Small single doses of prednisone and prednisolone produce extremely low levels in milk.
Sex Hormones - two cases of breast enlargement in male infants and one case of proliferation of vaginal epithelium in a female infant have been attributed to oral contraceptives. However, a clear cause and effect relationship has not been established, and studies measuring steroid levels in milk have found minimal amounts. Some studies have shown a decrease in protein, fat, and minerals in the milk of mothers using oral contraceptives, but these results have not been confirmed. The clinical significance of these effects, if they occur, is not clear.
Thyroid and Antithyroid - physiological amounts of T_3 and T_4 are excreted in normal women. Hypothyroid infants may be protected by breast milk and the diagnosis masked. Monitor thyroid function carefully in hypothyroid women on replacement therapy. Antithyroid drugs, both radioactive iodine and thionamides, are a contraindication to breastfeeding.

Psychotherapeutic Agents

Lithium - considered a contraindication to breastfeeding.
Phenothiazines - most or all phenothiazines are excreted in milk; drowsiness may occur occasionally. Long-term effects not well studied, but appear minimal.
Tricyclic Antidepressants - have not been studied well enough to define long-term effects, but only small amounts excreted in milk.

Table 7-21 (continued)

Radiopharmaceuticals

Discontinuation of breastfeeding for some period of time is necessary.

Sedative-Hypnotics

Barbiturates - lower amounts of "short-acting" agents than "long-acting" agents appear in milk. Large single doses appear to cause more drowsiness than multiple small doses.

Benzodiazepines - in general, these drugs are not well studied, but caution should be used.

Diazepam - should be avoided during lactation, especially early in neonatal period and in high doses. Sedation and weight loss have occurred, and jaundice is a possibility.

Social and Recreational Drugs

Alcohol - milk levels approximate plasma levels. No harm with occasional use, but prolonged high intake may be detrimental to infant. Doses greater than 1 g/kg inhibit milk ejection reflex and greater than 2 g/kg may completely block sucking-induced oxytocin release.

Caffeine - insignificant amounts excreted at usual intake levels of caffeine-containing beverages, but jitteriness reported in the infant of a mother with an extremely heavy caffeine use.

Nicotine - occurs in breast milk in measurable amounts that are not sufficient to harm infant. However, additional nicotine and other chemicals in smoke may be breathed in by the infant. Breastfeeding is another reason to discourage smoking.

Other drugs - neither the effects of marijuana, cocaine, and the hallucinogens nor their excretions have been studied. Any drug that incapacitates the mother will be detrimental to her care of the infant, but breastfeeding should not be used as a pretense for moralistic proclamations against the use of certain social drugs. Such statements may alienate the mother from the clinician rather than dissuade the occasional user.

From Anderson, P.O.: "Drugs and Breastfeeding." *Seminars in Perinatology: Human Lactation*, Vorherr, H. (ed.), III(3):271-278, July, 1979. Used with permission of Grune and Stratton, Inc., © 1979, New York, NY.

Some Abbrevations Used in the Nutrition in Primary Care Series

ATP	adenosine triphosphate
c	cup
cc	cubic centimeter
CNS	central nervous system
FDA	Food and Drug Administration
gm	gram
IBW	ideal body weight
IU	International Units
kcal	kilocalorie
kg	kilogram
lb	pound
lg	large
MCV	mean corpuscular volume
MDR	minimum daily requirement
med	medium
mEq	milliequivalent
mg	milligram
MJ	megajoule
ml	milliliter
oz	ounce
RDA	Recommended Dietary Allowances
RE	retinol equivalents
sl	slice
sm	small
Tbsp	Tablespoon
TPN	total parenteral nutrition
tsp	teaspoon
USDA	United States Department of Agriculture